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(54) Apparatus for forming cups of bras and bathing costumes

(57) An apparatus for forming cups of bras and bath costumes is characterized in that said apparatus comprises a plurality of heated punch elements, thereon can be applied differently sized caps operating without using conventional counter-molds and cooperating with a supporting lower heated plate, made of a metal material and including a plurality of holes therethrough, for allowing the punch caps to engage therein.

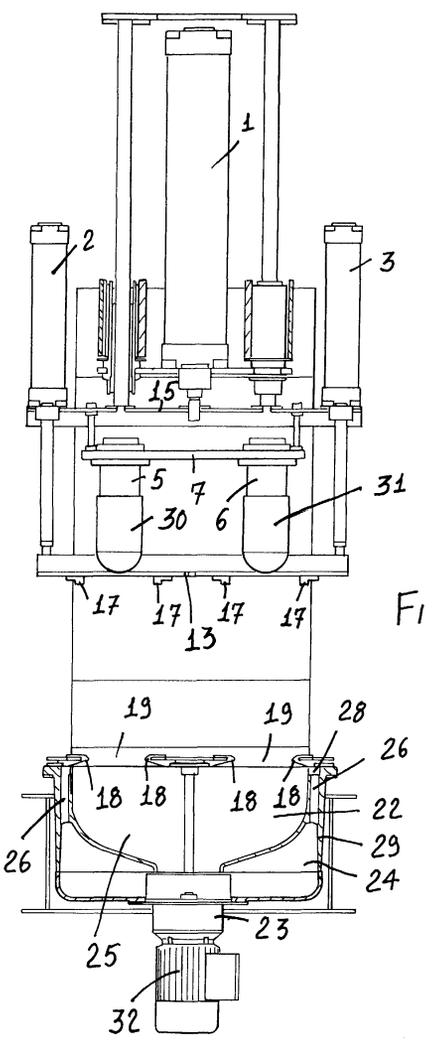

FIG. 1

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to an apparatus which has been specifically designed for forming the cup portions of bras and bath costumes.

[0002] A lot of machines for forming the cup portions of bras and bath costumes are already known.

[0003] However, prior machines have the drawback that they are very complex construction wise and of requiring a difficult adjusting operations, since they usually include a plurality of molds and counter-molds, which comprise built-in electric resistances and have a fixed size.

[0004] Since the size of a person wearing bras and bath costumes are very different, it is absolutely necessary to provide a very high number of said molds and counter-molds.

[0005] The problems, on the other hand, are not limited to the need of providing a great number of molds and counter-molds, but are further complicated by the requirements of changing the diameter, adjusting the depth, and also changing the inter-axis of the mentioned molds.

[0006] The latter parameter, in particular, cannot be lowered under given limits, since the counter-molds have a set constructional size thereunder it would not be possible to operate.

[0007] For the above mentioned reasons, prior apparatus are not adapted to allow the molds to be replaced and, in particular, do not allow to easily perform the necessary adjusting operations to provide bras and bath costumes suitable to meet the user requirements.

SUMMARY OF THE INVENTION

[0008] Accordingly, the aim of the present invention is to provide an apparatus, very simple construction-wise, but which, in the meanwhile, can be used for making cups of bras and bath costumes, of several sizes and configurations, by performing simple adjusting operations, and replacing the caps applied to the punches and the bottom plates applied to the bearing bed of the apparatus.

[0009] Within the scope of the above mentioned aim, a main object of the present invention is to provide such an apparatus including a plurality of operating punches having corresponding inter-exchangeable caps, operating without using conventional counter-molds.

[0010] The above mentioned aim and objects, as well as yet other objects, which will become more apparent hereinafter, are achieved by an apparatus according to claim 1.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Further characteristics and advantages of the apparatus according to the present invention will become more apparent hereinafter from the following detailed disclosure of a preferred, though not exclusive, embodiment thereof, which is illustrated, by way of an indicative, but not limitative example, in the accompanying drawings, where:

Figure 1 is a side elevation view illustrating the apparatus according to the invention;
Figure 2 is a partial detailed view of the apparatus according to the present invention, as laterally cross-sectioned;
Figure 3 illustrates a further schematic side view of the apparatus including two punch elements having respective caps;
Figure 4 is a further schematic side view illustrating a detail of the punch elements of the top fabric pressing assembly, of the bottom heated plate, of the silicone plate and teflon coating, allowing to form the cups of bras and bath costumes with the fabric material being in a locked condition;
Figure 5 is a further cross-sectioned side view, on an enlarged scale, illustrating a detail of the equipment, already shown in figure 4, and clearly shows the arrangement of the silicone plate and teflon coating, as applied to the bottom heated plate, to allow an operating method to be easily performed, with the fabric material in a locked condition;
Figure 6 illustrates a further cross-sectioned view, on an enlarged scale, of the operating element shown in figure 5, with the silicone plate and teflon coating forming the bottom bearing surface turned through 180°, thereby allowing to perform an operating method in which the fabric is recovered;
Figure 7 illustrates a schematic view of the top punch bearing plates, and clearly shows the configuration of the elongated slots and of the locating devices, of an adjustable type, provided with a plurality of tolerance recovering tooth elements and adapted to allow said punches and caps applied thereon to be mutually moved toward one another and away form one another;
Figure 8 illustrates a schematic detailed cross-sectioned view of the punch element, including a punch cap and a probe for reading temperature;
Figure 9 illustrates a bra, constituted by a flat fabric portion including two bulged portions, deformed by thermoforming by using the apparatus according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0012] With reference to the number references of the figures of the accompanying drawings, the apparatus according to the present invention comprises punch elements 5 and 6, suitably provided or coated by cap elements 30 and 31, which operates in cooperation with

top fabric pressing elements 17, in turn supported by a vertically movable frame 13, being driven by a main piston 1, with additional automatic pistons 2 and 3.

[0013] The latter are suitably calibrated, thereby providing an optimum pressing on the fabric material 40 to be processed.

[0014] As shown, the mentioned punch elements 5 and 6 are supported by an auxiliary frame 7, having a plurality of elongated slots 8 and 9, the main axis thereof is transversely arranged with respect to the front side of the apparatus.

[0015] The mentioned punch elements 5 and 6 supports the inter-exchangeable caps 30 and 31 which, as they are lowered, cooperate with the holes 19 formed in the bottom heated bed 18.

[0016] The elongated slots 8 and 9, in particular, house therein said punch elements 5 and 6, having said inter-exchangeable caps 30 and 31, to allow said punch elements to be mutually driven toward one another or away from one another, thereby allowing to easily form cups 41, as differently mutually spaced from one another.

[0017] This adjustment is performed by releasing a clamping lever 12, applied to each punch element, and by performing an adjusting operation in a cross direction, with respect to the machine, and in a longitudinal direction, with respect to the bra being made.

[0018] As shown, to each punch element 5 and 6 a toothed plate 36 is applied, thereagainst operates a locating pin 19 the end portion 11 of which allows each said punch elements 5 and 6 to be perfectly and asymmetrically adjusted and located.

[0019] As it should be easily apparent, such a manual operation would be very simple and quick.

[0020] Actually, upon having adjusted the mutual distances of said punch elements 5 and 6, by operating on the clamping lever 12, provided with a quick thread, it would be possible to properly lock said punch elements 5 and 6.

[0021] Said punch elements 5 and 6, in particular, are made of a brass material or metal alloys, designed for providing, in the meanwhile, a very good heat conduction and very high anti-seizing characteristics.

[0022] These anti-seizing characteristics, would be very important, since said punch elements 5 and 6 are applied with coating caps 30 and 31 including different diameters, to provide the cups 41 with the desired diameter.

[0023] Said caps 30 and 31 are conductively heated by said punch elements 5 and 6 which, as already stated, are heated by built-in electric resistances, housed therein.

[0024] Moreover, the punch elements 5 and 6 comprise thermo-probes 14, mounted on respective springs, which are urged to contact the inner surface of the caps 30 and 31.

[0025] The latter, while they can be easily replaced, are brought and held to an optimum temperature, thereby thermoforming the synthetic fabric material 40 forming the cups 41 of the bra or bath costume 42.

[0026] It should be pointed out that the caps 30 and 31 are downward urged, thereby providing a reciprocating vertical movement, under the action of the main piston 1.

[0027] The latter downward drives the plate 15, in turn supporting the further plate 7 thereon the punch elements 5 and 6 and caps 30 and 31 are mounted.

[0028] The plates 15 supports, in turn, the pneumatic pistons 2 and 3 operating on a bottom plate 13.

[0029] The latter support fabric pressing elements 17, cooperating with a bottom supporting plate 18, made of a metal material and including a plurality of holes 19 for engaging therein the caps 30 and 31 of the punch elements 5 and 6.

[0030] It should be apparent that the diameters of said holes 19 must be slightly greater than the diameters of the caps 30 and 31.

[0031] The bottom supporting plate 18 can be easily inter-exchanged, depending on the diameter of the caps 30 and 31 and the interaxis thereof.

[0032] The bottom supporting plate 18 defines at the top a chamber 22 in which is conveyed super-heated air, having a temperature which can be suitably changed depending on the fabric material fibers.

[0033] The bottom supporting plate 18 is made of any suitable metal material, and is heated by the super-heated air contacting this plate.

[0034] Moreover, said plate is coated by an insulating layer 21 and a further plate 32, preferably made with a silicone material and suitably perforated.

[0035] Said two insulating layers 21 and 32 can be properly reversed, by turning over them through 180°, thereby providing different locking characteristics for locking the perimetrical edge portions of the fabric material to be used for forming the cups.

[0036] More specifically, as the silicone plate 32 is arranged above the insulating layer 21, the fabric material will be processed in a locked condition thereof.

[0037] On the other hand, by turning over the above two layers, the fabric material will be processed by a recovery type of processing method, since the surface of the insulating layer 21 is coated by a slipping material.

[0038] The fabric material 40, during the forming of the cups 41, is held pressed between the fabric pressing elements 17 and bottom supporting plate 18.

[0039] As stated, the operating step for forming the cups 41 is carried out by a heating of the fabric material 40, which is partially urged by the caps 30 and 31 inside a chamber 22, which is heated by a hot air flow.

[0040] The latter is circulated through said chamber 22 by a centrifugal fan 23, driven by a driving motor 32 and sucking the air contained in said chamber 22, while conveying it to the chamber 24.

[0041] Then, the air will be conveyed through suitable ducts 26.

[0042] The latter are provided in contact with heating

elements.

[0043] Thus, as air is conveyed through said ducts 26, it will be heated, and then it will exit the slots 28 so oriented as to provide said air with a swirling movement.

[0044] Thus, the above mentioned heated air flow will at first contact the plate 18, thereby heating the latter.

[0045] Then, the heated air flow will impinge on the fabric material 40, held under tension by the caps 30 and 31, thereby thermoforming said fabric and providing perfectly shaped and sized cups 41.

[0046] Thus, the above mentioned result will be obtained owing to the heating operation of the heated air, which is perfectly adjusted.

[0047] Said adjustment is performed by the thermostatic probe 14, included in the body of the chamber 22, and by an outer thermoadjusting element.

[0048] In this connection it should be pointed out that a further very important feature of the apparatus according to the present invention consists of the provision of an adjusting device designed for adjusting the length of the stroke of the piston urging the forming caps 30 and 31 into the chamber 22.

[0049] Such an adjusting device is of an electromechanical type, with an electronic control unit for controlling the linear stroke of said piston 1.

[0050] The pistons 2 and 3, in particular, can be adjusted or calibrated so as to provide the desired pressure on the fabric pressing elements 17.

[0051] While the apparatus according to the present invention has been thereinabove disclosed by way of a mere illustrative example, it should be apparent that it is susceptible to several modifications and variations, all of which will come within the scope of the invention.

Claims

1. An apparatus for forming cups of bras and bath costumes, **characterized in that** said apparatus comprises a plurality of heated punch elements to which are coupled differently sized inter-exchangeable caps, operating without using counter-molds, and cooperating with a bottom supporting plate, made of a metal material and including a plurality of holes allowing the caps of said punch elements to be engaged therein.

2. An apparatus for forming cups of bras and bath costumes, according to the preceding claim, **characterized in that** said punch elements cooperate with top fabric material pressing means, said top fabric material pressing means being supported by a vertically movable frame and being driven by a principal piston, associated with two suitably calibrated pneumatic pistons, thereby providing said fabric material being processed with a set pressure.

3. An apparatus for forming cups of bras and bath costumes, according to one or more of the preceding claims, **characterized in that** said punch elements are supported by an auxiliary frame, having elongated slots, the major axis of which is arranged transversely of the front side of the apparatus.

4. An apparatus for forming cups of bras and bath costumes, according to one or more of the preceding claims, **characterized in that** said punch elements support said inter-exchangeable caps which, as they are lowered, cooperates with holes formed in a bottom heated bed of said apparatus.

5. An apparatus, according to one or more of the preceding claims, **characterized in that** said elongated slots house said punch elements so as to allow said punch elements to be mutually moved toward one another and away from one another, thereby allowing to form differently mutually spaced cups.

6. An apparatus, according to one or more of the preceding claims, **characterized in that** said adjustment is performed by releasing a clamping lever applied to each punch element and by performing an adjustment operation in a direction transversal of said apparatus and in a longitudinal direction with respect to the bra being formed.

7. An apparatus, according to one or more of the preceding claims, **characterized in that** to each said punch element is applied a toothed plate, thereagainst operate a locating pin, having an end portion allowing to perfectly and symmetrically adjust the positions of each of said punch elements.

8. An apparatus, according to one or more of the preceding claims, **characterized in that** said apparatus further comprises adjusting means for adjusting the mutual distances of said punch elements, said adjustment being provided by operating a quick thread clamping lever, and locking said punch elements.

9. An apparatus, according to one or more of the preceding claims, **characterized in that** said punch elements are made of a bras material or metal alloys, thereby providing a very high heat conduction and anti-seizing characteristics.

10. An apparatus, according to one or more of the preceding claims, **characterized in that** to said punch elements are inter-exchangeably applied coating caps, having different diameters, to allow said apparatus to provide cups of different diameters.

11. An apparatus, according to one or more of the preceding claims, **characterized in that** said caps are heated from said punch elements by heat conduc-

tion, said punch elements being in turn heated by electric resistance engaged inside said punch elements.

12. An apparatus, according to one or more of the preceding claims, **characterized in that** said punch elements comprise thermoprobes urged by springs and driven to contact the inner surfaces of said caps.

13. An apparatus, according to one or more of the preceding claims, **characterized in that** said exchangeable caps are brought and held to a set optimum temperature, thereby thermoforming the synthetic fabric material forming said cups of said bra and bath costume.

14. An apparatus, according to one or more of the preceding claims, **characterized in that** said caps are urged downward, thereby providing a reciprocating vertical movement, as driven by said main piston.

15. An apparatus, according to one or more of the preceding claims, **characterized in that** said main piston downward drives a plate which in turn supports a further mounting plate thereon are mounted said punch elements and caps.

16. An apparatus, according to one or more of the preceding claims, **characterized in that** one of said plates supports, in turn, said pneumatic pistons operating on said bottom plate.

17. An apparatus, according to one or more of the preceding claims, **characterized in that** said bottom plate supports fabric pressing means, cooperating with a bottom supporting heated plate made of a metal material and including a plurality of holes therein are engaged said caps of said punch elements.

18. An apparatus, according to one or more of the preceding claims, **characterized in that** said bottom supporting heated plate can be interexchanged depending on the diameter of said caps of said punch elements and on the interaxis thereof.

19. An apparatus, according to one or more of the preceding claims, **characterized in that** said apparatus comprises moreover a bottom supporting heated plate, which defines at the top thereof a chamber thereto is conveyed superheated air, at variable temperatures, depending on the fibers forming said synthetic fabric materials.

20. An apparatus, according to one or more of the preceding claims, **characterized in that** said apparatus comprises a bottom supporting plate which is made of a metal material and is heated by a heated air flow.

21. An apparatus, according to one or more of the preceding claims, **characterized in that** said bottom supporting heated plate is coated by a thermally insulating layer and by a plate, preferably made of a silicone material, and having perforations therethrough.

22. An apparatus, according to one or more of the preceding claims, **characterized in that** said apparatus comprises insulating layers, which can be turned over through 180°, thereby providing different locking characteristics for locking the perimetrical edges of said fabric material being processed for forming said cups.

23. An apparatus, according to one or more of the preceding claims, **characterized in that** said fabric material, as said cups are formed, is held in a pressed condition between said fabric pressing means and said bottom supporting heated perforated plate.

24. An apparatus, according to one or more of the preceding claims, **characterized in that** said cups are formed by heating said fabric material which is partially urged by said caps inside said heated air flow heated chamber.

25. An apparatus, according to one or more of the preceding claims, **characterized in that** said apparatus further comprises a centrifugal fan for circulating said heated air through said chamber, said centrifugal fan sucking the air held in said chamber and conveying said sucked air to a further chamber.

26. An apparatus, according to one or more of the preceding claims, **characterized in that** said apparatus further comprises a plurality of ducts for conveying said heated air, said ducts contacting heating means.

27. An apparatus, according to one or more of the preceding claims, **characterized in that** said air is overheated by causing said air to pass through said ducts and exiting said slots, which are so oriented as to provide said air with a swirling movement.

28. An apparatus, according to one or more of the preceding claims, **characterized in that** said heated air flow contacts at first said plate by heating it.

29. An apparatus, according to one or more of the preceding claims, **characterized in that** said heated air flow is caused to impinge on said fabric material which is held under tension by said caps, thereby

thermoforming and providing perfectly shaped and sized cups.

30. An apparatus, according to one or more of the preceding claims, **characterized in that** said cups are so bulged by said heated air, and that the temperature of said heated air is perfectly adjusted by a thermostatic probe engaged in the body of said chamber and by an outer thermo-adjusting device.

31. An apparatus, according to one or more of the preceding claims, **characterized in that** said apparatus further comprises an adjusting device for adjusting the length of the stroke of said piston causing said forming caps to enter said chamber.

32. An apparatus, according to Claim 31, **characterized in that** said adjusting device is of an electromechanical type provided with an electronic control unit for controlling the linear stroke of said piston.

33. An apparatus, according to one or more of the preceding claims, **characterized in that** said apparatus comprises adjustable pistons which are so adjusted as to provide a set pressure on said fabric material pressing means.

34. An apparatus for forming cups of bras and bath costumes, according to one or more of the preceding claims, **characterized in that** said apparatus comprises specifically designed constructional elements, and substantially as broadly disclosed and illustrated in the preceding disclosure and in the figures of the drawings accompanying the subject Patent Invention Application.

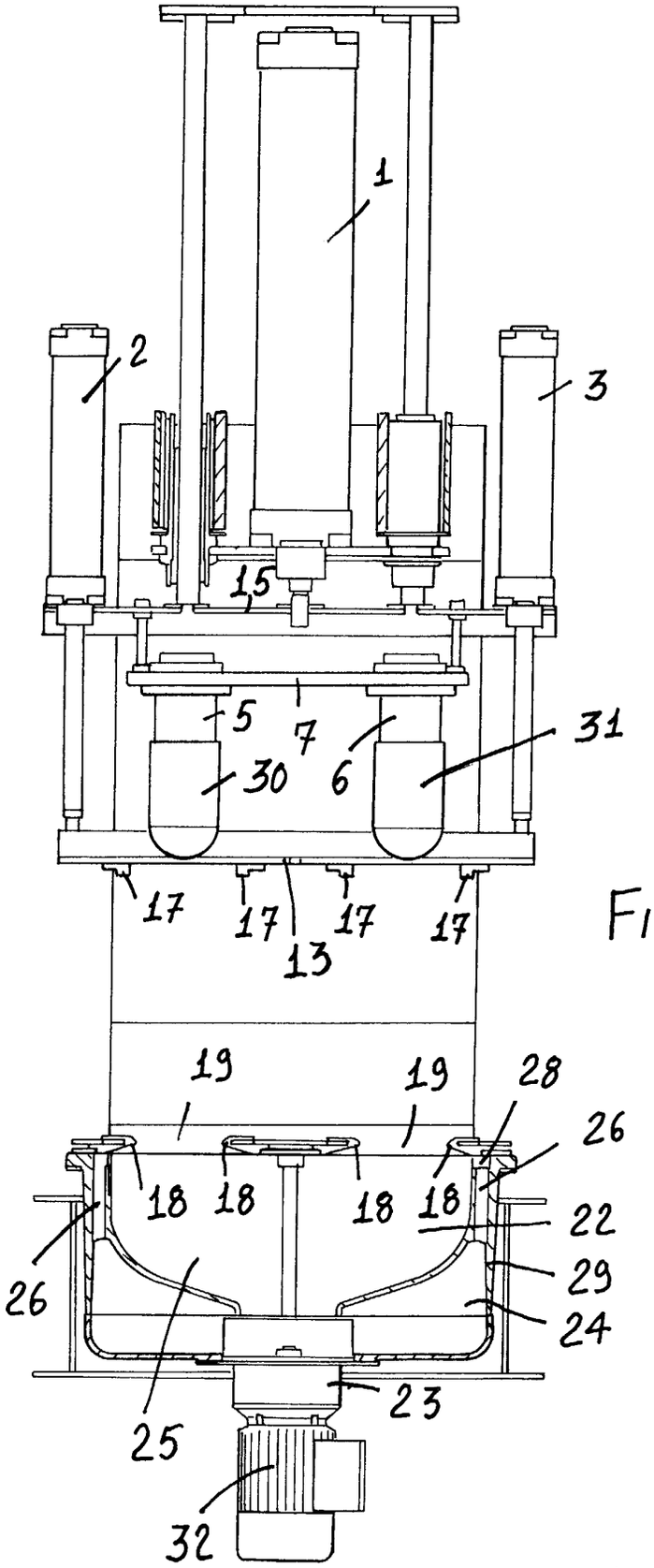
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FIG. 1

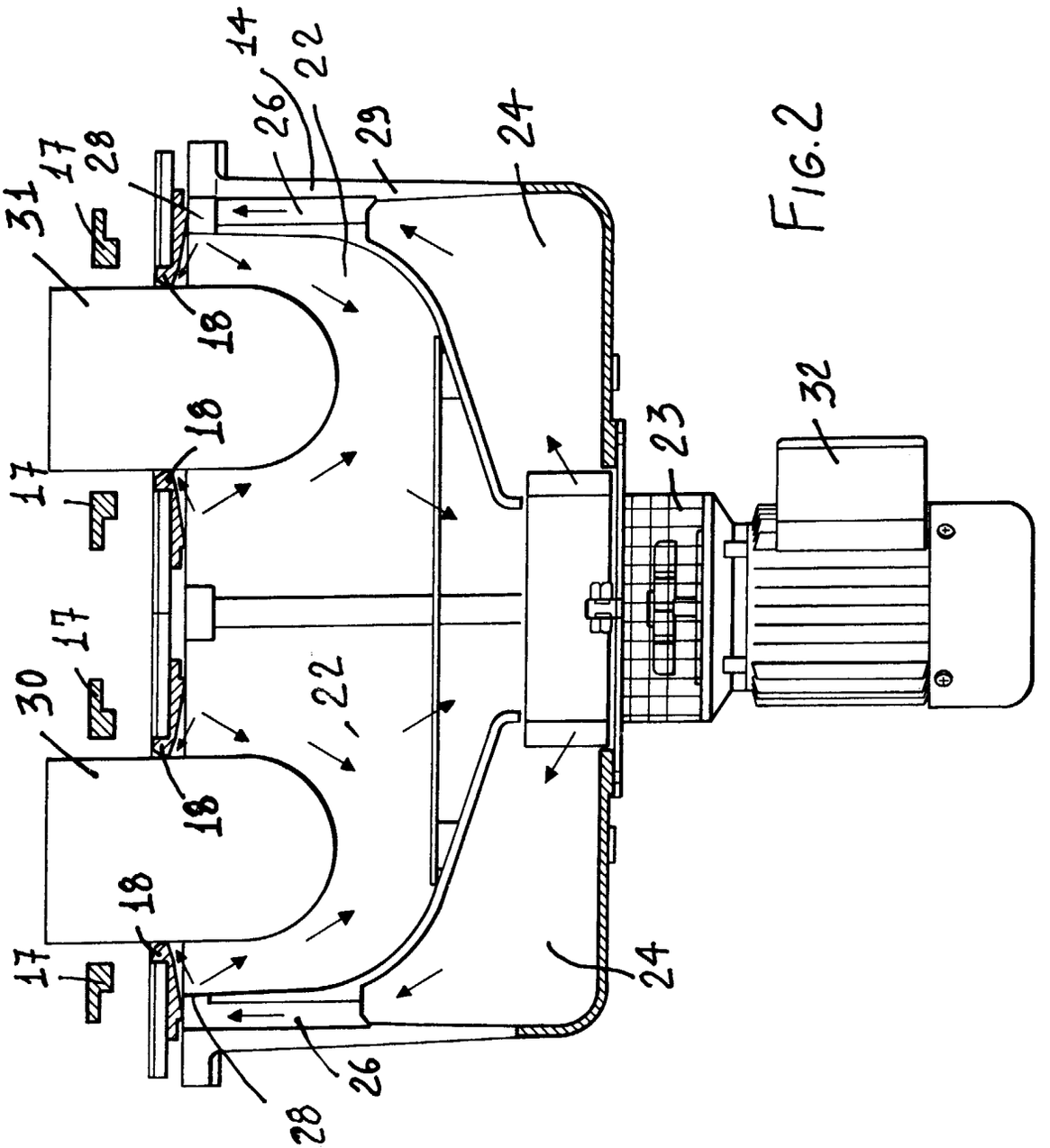

FIG. 2

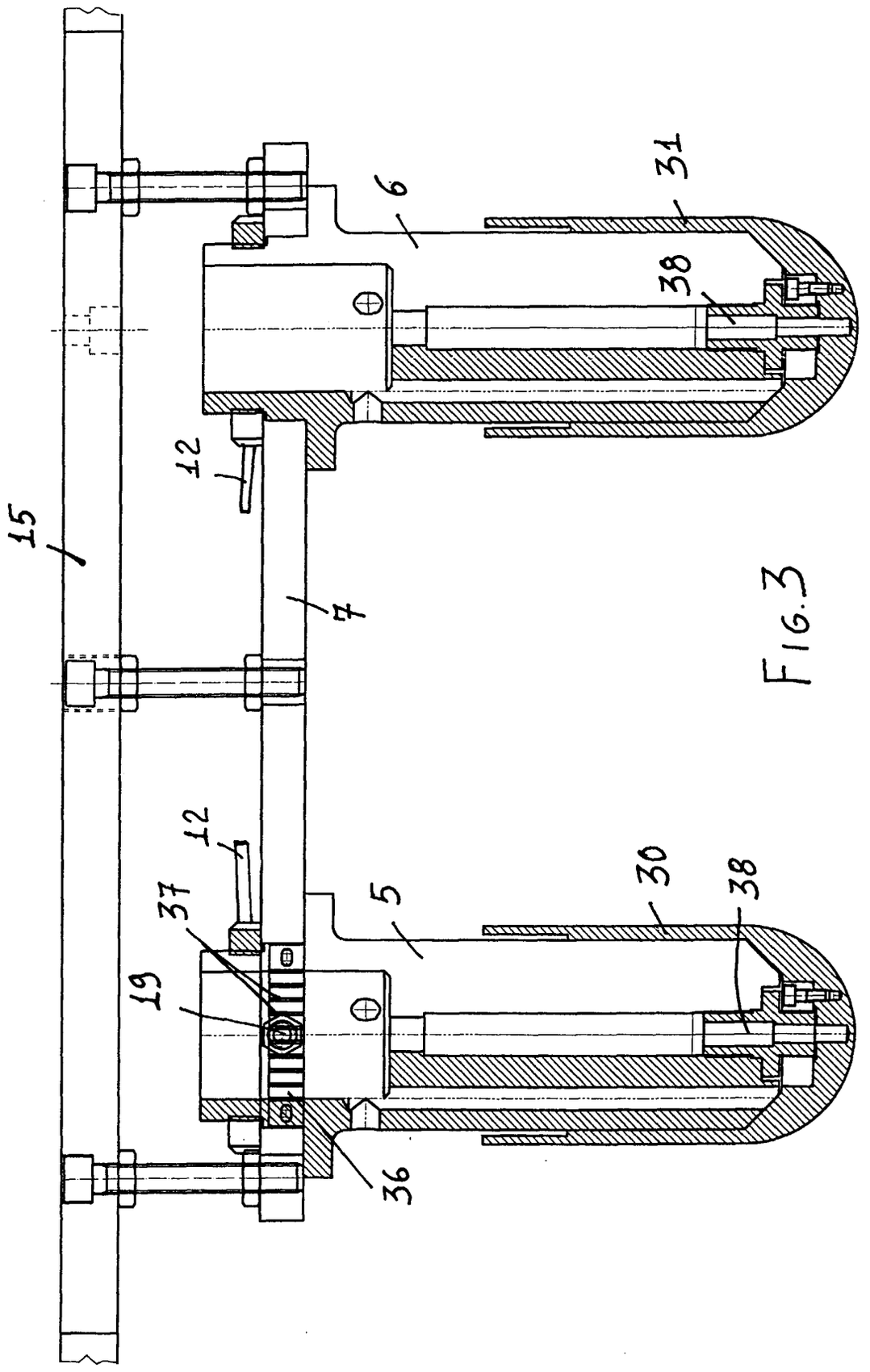

FIG. 3

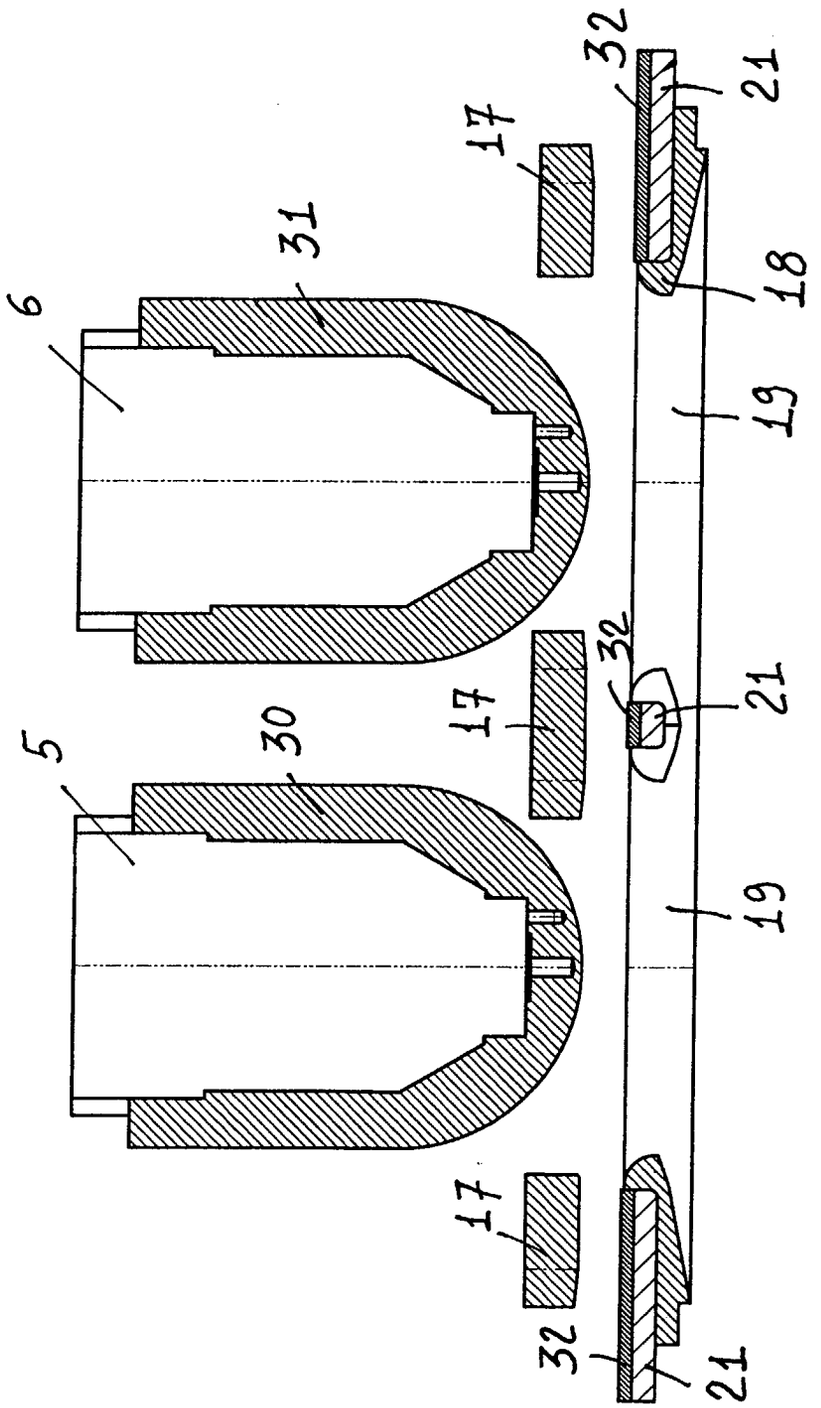

FIG. 4

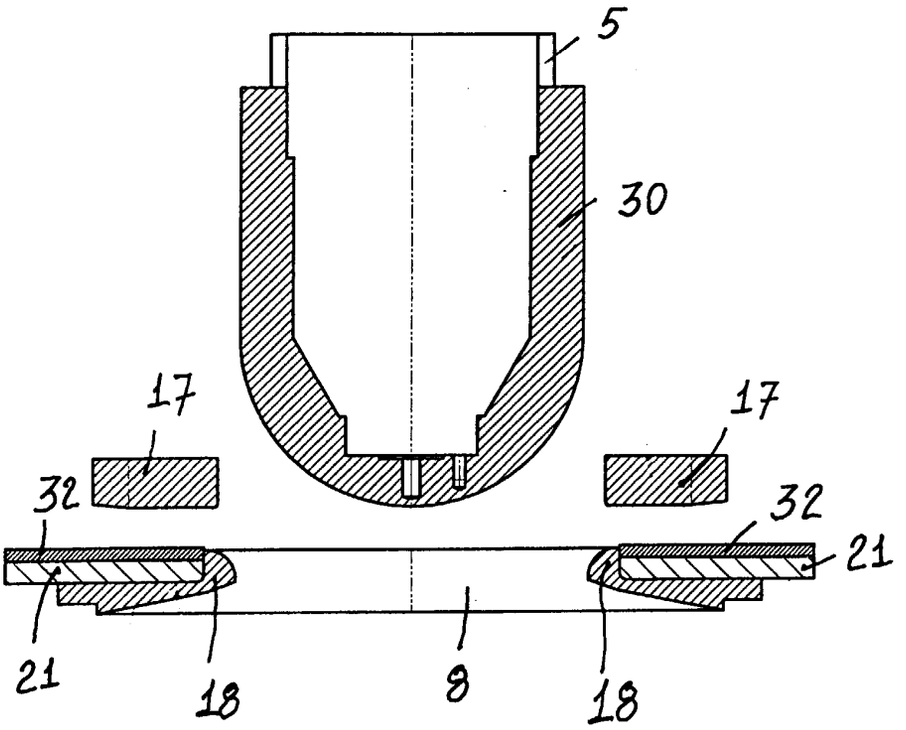

FIG. 5

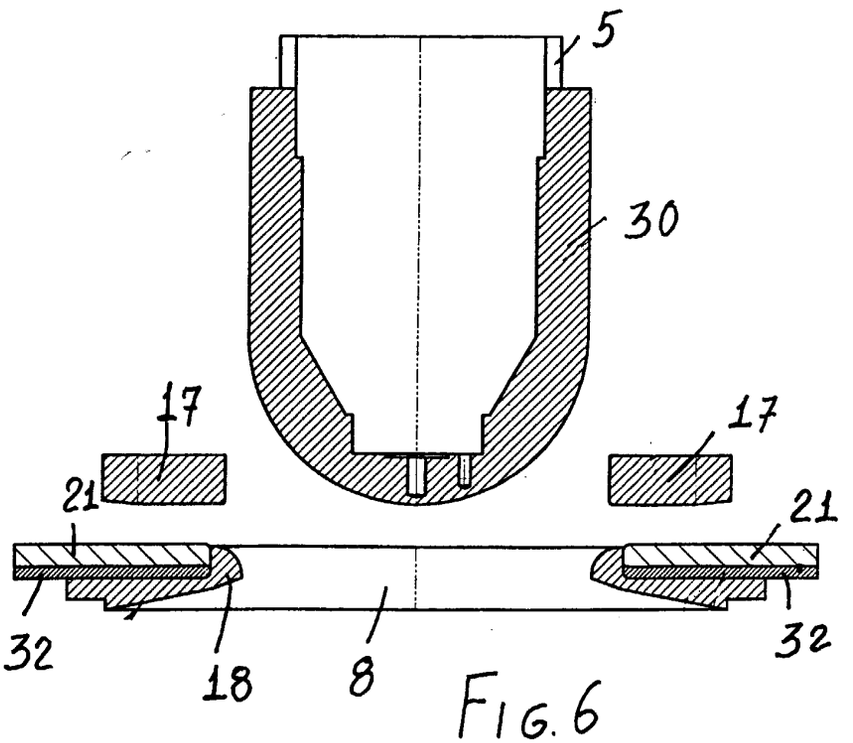

FIG. 6

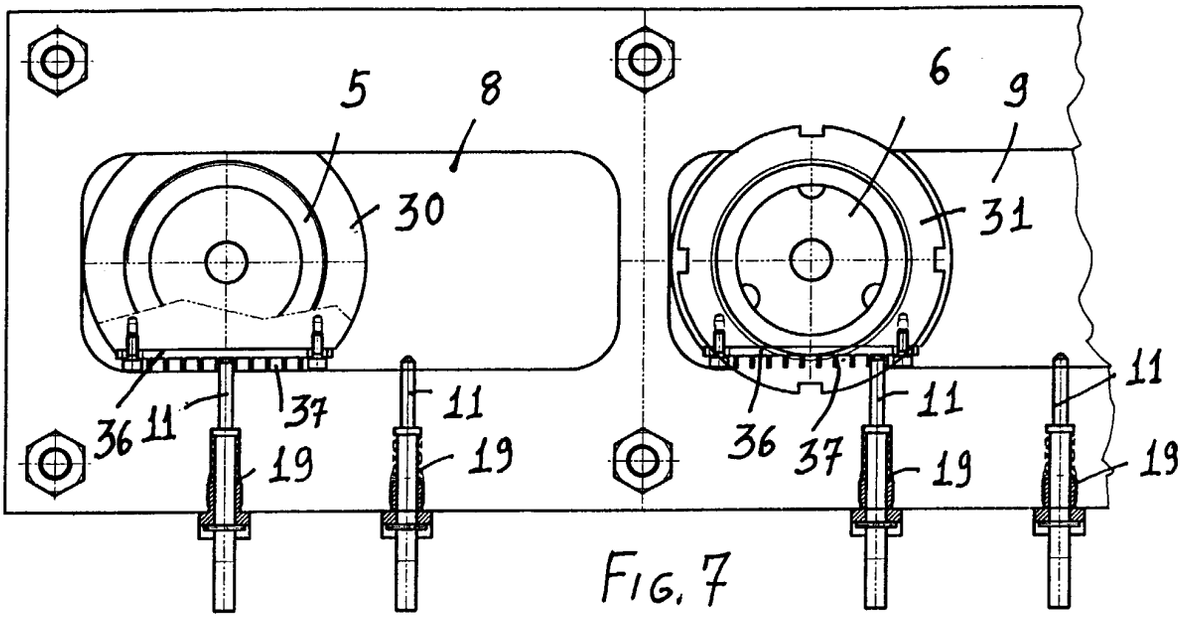

FIG. 7

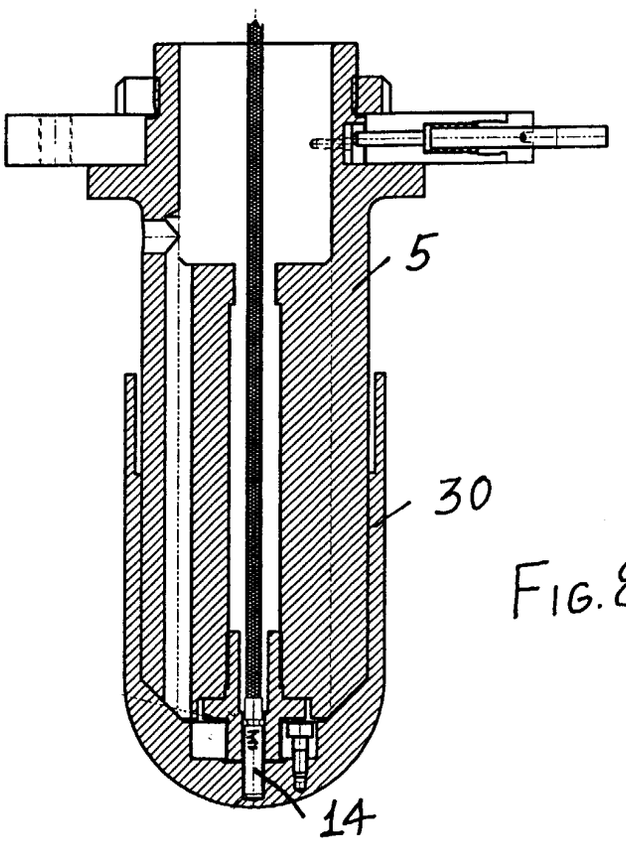

FIG. 8

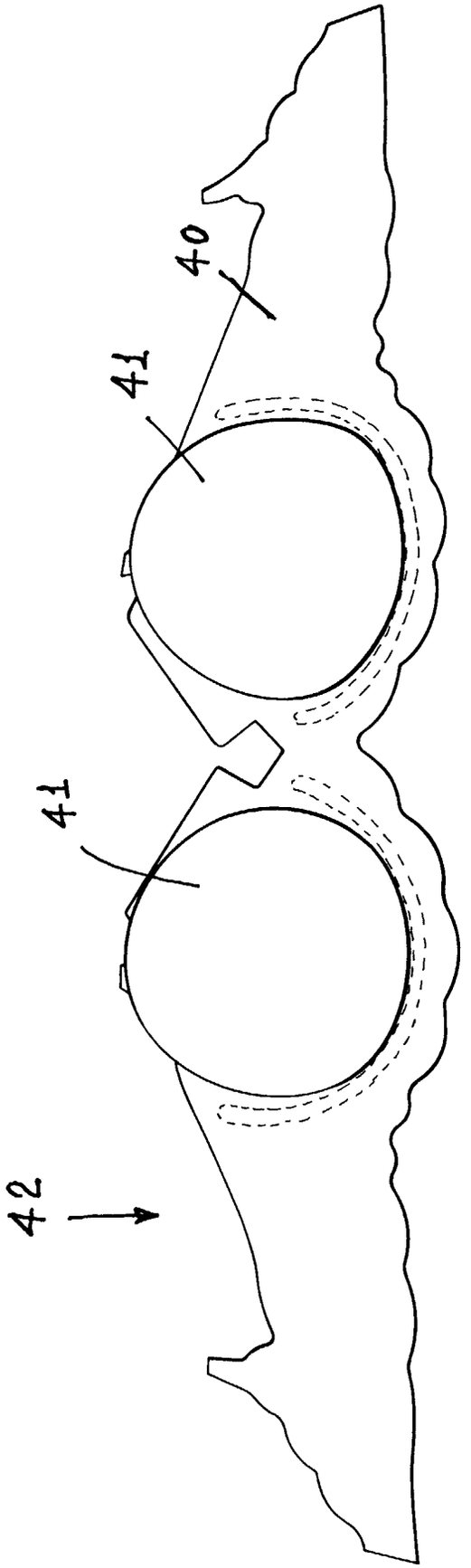

FIG. 9